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including self-determination, molybdenum, rocks, soils, and climate. Divisions of space are interesting: corn (maize)—1 page; pigs—16 lines; molybdenum—10 lines; nitrates—11 lines; causes of emigration—20 lines; Northeast and Northwest Passages—1 page (39 lines); slave trade—3½ pages.

Furthermore, there are many mistakes in statements of fact. "Brazil overshadows all other countries in annual output" [of rubber] (p. 50). The book was copyrighted in 1920, two years after the collapse in the rubber price resulting from the enormous cultivations in the Orient which had far surpassed poor Brazil in amount. The author's knowledge of rubber appears to be botanic, encyclopedic, about ten years behind the time, and with no economic flavor worth mentioning. Turning over a page one sees that Egypt produced in the year 1918–1919 4,800,000 bales (of 400 lbs.) of cotton. The United States Department of Agriculture puts it at 1,304,000 bales (of 478 lbs. net) in 1918; 999,000 in 1919.

I believe in a liberal forgiveness for mistakes, but the above-mentioned are egregious. So is this: "Warm currents wash the western coasts (in temperate regions), and the prevailing winds are from the south and west." Most of the children's geographies in America have a special designation to show that the currents along the western coasts of South America and Africa and California are *cold* or *cool.* I wonder how the author would prove his statement that "Slavery in Africa, or even in Mediterranean Europe, was a kindly bondage compared to what the black man had to face in America." What is Africa's record of slavery?

In some places the book does come up to definition and discuss *principles*, which I believe are *ideas;* but some of the discussion is of political geography, and most of it is merely another case of the statements of fact without cause or result so common on the other side in books which Mr. Cundall recently called, very properly, "mere cramming implements."

Perhaps much of the trouble is indicated by the author's remarkable statement in the introduction. In discussing the scope of economic geography and its relation to various other sciences he says, "An adequate knowledge of the tributary sciences is helpful but not essential to the geographer." I want to emphasize the opposite idea most emphatically. One of the chief handicaps of geography at this moment is that it has so *few* men adequately trained in tributary sciences. I hope we do not have to await the creation of these men before we have a real "Principles of Economic Geography."

Howarth's little book of 234 small pages, about 55,000 words, is smaller than Rudmose Brown's; other than this it offers great contrast. It is *full of geography,* splendidly illustrated, with 33 inexpensive black-and-white maps that carry points very effectively. One of these is a map of southeastern Asia showing rice regions by dots and heavy population by heavy vertical rulings, indicating striking similarity in location of the two factors.

The chapter titles show the plan. They are: General Considerations, Cold Regions, Temperate Lands, Temperate Lands (*cont.*), Hot Lands, Fisheries, Mining and Manufactures, Transport, Trading Centers, Grain Trade, British Isles, Scandinavia and Russia, Central Europe, European Mediterranean and Balkans, North America, Temperate Lands in Southern Hemisphere, The Monsoonal and Other Asiatic Territories, The Hot Lands in Africa and America, and the Pacific Islands.

The book starts by reproducing Herbertson's well-known Natural Regions Map. The first half of the book, which shows much thought, continually ties back to this piece of fundamental geography. The latter part of the work is less geographic and more encyclopedic—often mere statements that this or that is here or there.

J. RUSSELL SMITH

SOME METEOROLOGICAL BOOKS

GEORGE A. CLARKE. **Clouds: A Descriptive Illustrated Guide-Book to the Observation and Classification of Clouds.** With a Preface by Sir Napier Shaw. xvi and 136 pp.; maps, diagrs., ills., index. E. P. Dutton & Co., New York. $8.00. 8½ x 5½ inches.

A. E. M. GEDDES. **Meteorology: An Introductory Treatise.** xx and 390 pp.; maps, diagrs., ills., index. Blackie & Son, Ltd., London, Glasgow, and Bombay, 1921. 21 s. 9 x 6 inches.

R. G. K. LEMPFERT. **Meteorology.** x and 186 pp.; maps, diagrs., ills., index. Methuen & Co., Ltd., London, 1920. 7s., 6d. 7½ x 5 inches.

Mr. Clarke's book on clouds is well described in the subtitle: he has contributed a unique collection of photographs, the faithful effort of many years; and the publishers have done their part equally well. There are four color plates—all unique and excellent though perhaps a trifle vivid, seventy-two photographs, and seventeen diagrams and figures. No one who admires skyscapes should be without this book; for it gives with well chosen illustrations and in carefully written text about all that one ordinarily wishes to know about clouds.

While recognizing that it needs overhauling, Mr. Clarke accepts the International Classification of the clouds, which embraces five general divisions and ten types. There are types, however, which lie outside this scheme; and these, like the mammato-cumulus, the lenticularis, and the turret clouds, are listed separately.

A rather brief account of cloud velocities is given, and it is evident that it is not the practice at British meteorological stations to get actual velocities. A Fineman nephoscope is employed, and only angular velocities are recorded. If these are reduced, using average values for the types of cloud as given in the International Classification, the average actual velocities are: cirrus, 60 miles per hour; cirro-stratus, 60; cirro-cumulus, 45; alto-cumulus, 30; alto-stratus, 35; strato-cumulus, 22; cumulo-nimbus (central mass), 35; and cumulus, 31. Mr. Clarke adds that some of the individual velocities for cirrus are very high; for, assuming the cloud to have been only 23,000 feet instead of the 30,000 feet given as the average, the velocities not infrequently reached 100 or 130 miles per hour. Our author may feel justified now in using the higher value, for by direct measurement at Blue Hill Observatory, a cirrus cloud has been recorded traveling at the rate of 102.6 meters per second, that is 228 miles per hour. There are supporting records on various dates of 94 meters per second (210 miles per hour) and 84 meters per second (188 miles per hour). Velocities of 60 meters per second, or 130 miles per hour, are not infrequent.

Four striking photographs of the upper surfaces of cumuli and strato-cumuli made in an airplane (old style aeroplane) by Captain C. K. M. Douglas, are added to the sixty-eight cloud photographs of Mr. Clarke. These were made at heights of 3,000 meters.

It is a little singular that there is no reference to Clayton's first-class work at Blue Hill and only a reference at second hand to Bigelow's extensive report. We might mention too, that no details concerning the photographic methods employed are given. It is all very well to show beautiful photographs; but in a book of this character a few words of advice and instruction to those who would like to try their prentice hand "catching the clouds" would be much appreciated.

Dr. Geddes, a lecturer in natural philosophy in the University of Aberdeen, who adds to classroom experience knowledge gained during the war in the Meteorological Section of the Royal Engineers, has given us an unusually lucid and well written textbook. Recognizing that there are others in the world besides undergraduates, he writes for aviator, farmer, sailor, and even the holiday-maker. The lengthy introduction contains a strong plea for an educated public; for something more than Weather Bureau or even a Meteorological Society; and we agree that this is necessary if weather observations and forecasts are to be understood and utilized to full advantage. Dr. Geddes is right in saying "There is perhaps no other subject which attracts the attention of so many people, yet perhaps there is no other subject about which so many false ideas exist."

The succeeding chapters deal with the Atmosphere, Radiation, Temperature, Pressure and the General Circulation, Water Vapor, the Minor Circulations, the Free Atmosphere, Atmospheric Electricity, Atmospheric Optics, Atmospheric Acoustics, and Weather Forecasting and Climate.

Dr. Geddes is a physicist and so clearly recognizes the value of employing scientific units. For temperature, he says, referring to the absolute Centigrade scale, "this scale is the only scale on which there is a definitely fixed temperature, the absolute zero of temperature." He is evidently not aware of the Kelvin-kilograde scale. He says, "I have employed the gas scale [the absolute Centigrade] throughout." But the types have played him false, for Figures 1 and 2, thermograph records August 1 and August 3, 1919, at Aberdeen, are in degrees Fahrenheit, without even equivalent values. The time scale, however, shows that the Aberdonians (and this is generally true of British observers) are ahead of Americans, for the hour which we call 11 P. M. they call 23.

The book is one which the professional meteorologist will find convenient for reference, and the layman will find not only readable but stimulating.

In "Meteorology" Mr. Lempfert has endeavored to present in simple speech, and we may add in attractive dress, the chief results derived from modern methods of air exploration. In fact, he brings up to date Dickson's volume on "Meteorology" which appeared in the University Extension Series about 1893. The observational side is subordinated to dynamical studies; and climatological data and descriptions of instruments have been omitted.

As Superintendent of the Forecast Division of the British Meteorological Office, Mr. Lempfert is well qualified to set forth the possibilities—and limitations—of the synoptic map, on which, as we all know, official forecasters rely.

The Weather Map is explained in detail, and the somewhat astonishing statement is made that "despite the fact that maps have now been drawn day by day for over half a century, we may safely say that no two maps have been identical." For that matter, no two snow crystals are identical; but they can be classified and grouped; and so can weather maps. This should have been added.

Mr. Lempfert writes in an easy and familiar way of the work of the forecasters during the Great War. The book begins with a study of a certain anticyclone which persisted from September 5 to 14, 1915. Probably because the author is a forecaster he realizes what most writers of meteorological books have failed to comprehend, namely, that the anticyclone is the dominating factor in determining weather sequences. Apparently it controls the path and speed of the "lows" following it.

There are different types of "highs," and, unfortunately, the Weather Map gives little indication of such difference. There are cloudless anticyclones and clouded anticyclones if the latter word may be allowed. In the cloudless type in summer, high temperatures prevail; and, as the condition is one of stagnation, there is an accumulation of heat in the lower levels and so a hot spell lasting several days—a period when the forecaster can promise no relief. In the same type during winter, because of free radiation, extremely low temperature may occur. In the other type of "high" the temperature amplitudes are limited, and conditions are more uniform. At such times surface readings of pressure and temperature may mislead the forecaster.

A good illustration of a "cyclone," "depression," or "low" is that of February 17, 1915; and the discussion loses nothing of interest when the author drives home the fact that two German airships were wrecked on the coast of Denmark through stress of weather. This happened, our author states plainly, because the German forecasters were unable to locate the center of the depression—which was over Ireland. With commendable frankness, however, he states that British forecasters, lacking definite information, would have been unable to do any better than their German colleagues. The reviewer, who happens to have had some experience in Europe during the war in connection with forecasting, ventures the opinion that if the matter could be investigated closely it would appear that delay in transmission of weather reports hampered the forecasters, for even in France it was no unusual thing to receive morning reports late in the afternoon.

The map for October 19, 1917, the date of the great Zeppelin raid, is given and is a good example of an anticyclonic wedge. An unexpected strong current from the north carried the air fleet (13 in number) out of course, on the return, and led ultimately to the loss of 8 airships—the flower of Germany's air fleet.

The chapters on Temperature and Clouds are brief but to the point. Only eight illustrations of cloud types are given. On page 47 the place of the highest sounding balloon record is given as Padua. We understand the record was made at Pavia.

In the chapter on the Stratosphere, on page 144, it is stated that the lowest recorded temperature "at ground level is 213a, observed on the great ice barrier of the Ross Sea on July 6th, 1911, by Captain Scott's expedition." We believe that there is an authentic reading of 205a (751 Kelvingrads,—68° C.,—90° F.) at Verkhoyansk, February 5-7, 1891. This is erroneously given several degrees lower in Woeikof's "Meteorologie," 1910. In this chapter no mention is made of Professor Humphreys' explanation of the cause of the stratosphere: although proper mention is made of Gold's work on what may be called the radiation balance sheet for different levels of the atmosphere.

Other chapters deal with the thermal structure of the atmosphere, origin of changes of pressure, tropical storms, and the chemical composition of the atmosphere.

ALEXANDER MCADIE

CLIMATOLOGICAL ATLAS OF GERMANY

G. HELLMANN AND OTHERS. **Klima-Atlas von Deutschland.** 63 pp. of maps, 40 pp. of text. Dietrich Reimer (Ernst Vohsen), Berlin, 1921. $7.00 bound. 12 x 14 inches.

The Prussian Meteorological Institute, with an enviable record of effective service to meteorology behind it, has added another important volume to its already long list of valuable publications. In the new "Klima-Atlas" of Germany, we have presented all the